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COMPLETE SPECIFICATION

Improvements in or relating to Rocket Missiles

We, ERIK WALDEMAR BRODÉN, of Heimdalsgatan 4B, Linköping, Sweden, SVEN HUGO NORDSTRÖM, of Malmskogen, Linköping, Sweden, and INGA TORA MARIA NORDSTRÖM, of Malmskogen, Linköping, Sweden, all Swedish citizens, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention refers to a gas turbine arrangement in rocket missiles in order to stabilize the missiles in their trajectories by making said missiles spin.

To stabilise a missile in its trajectory several different methods are used. One method is to make the missile spin, which can be done either by rifling the bore of the weapon from which the missile is discharged or by fitting the rear part of the missile with canted fins. Another method is to provide the missile with a number of steering tail-fins, guiding the missile in its trajectory.

With rockets it is known to let the exhaust gases escape through a number of circularly arranged inclined separate jets, which by the inclination of the reaction forces make the missile spin. The present invention is used in rocket missiles with a single axially arranged de Laval nozzle imparting spin to the missile in a different manner.

The present invention consists in a rocket missile fitted with a combustion chamber for the propellant contained inside the rocket, an axially arranged de Laval exhaust nozzle extending from said chamber to the rear end of the missile and a number of canted or cambered vanes arranged inside the missile in front of the exhaust nozzle exit, said vanes causing rotation of the exhaust gases when they leave the missile, said vanes giving the gases a tangential component of velocity. According to the law of action and reaction the missile, when seen from behind, will spin clockwise if the exhaust gases rotate anticlockwise when leaving the missile (or *vice versa*) and the missile moves forward when the exhaust gases escape backwards from the same.

Below the invention is described more in particular with reference to the drawing annexed, which shows a longitudinal section of a rocket missile fitted with a gas turbine arrangement according to the invention (the gas turbine being shown in full).

The interior of the missile 1 is occupied by the combustion chamber 2, in this case containing the propellant.

At the rear portion of the missile there is an axially arranged de Laval nozzle 3, forming an outlet for the exhaust gases generated at the combustion of the propellant.

According to the invention a number of suitably shaped, star-like plane canted or cambered vanes 4 is placed between the combustion chamber 2 and the exhaust nozzle 3. Inside the centre of the star-like arrangement there is a streamlined body 5 shaped to give the inlet of the nozzle 3 an aerodynamically convenient form. The star-like arrangement 4 and the body or nave 5 form a turbine wheel fixed in the missile by welding the outer ends of the vanes to the wall of the combustion chamber, or by fixing the outer-ends in splines in the wall or in some other way. On the combustion of the propellant this turbine makes the exhaust gases rotate when they leave the missile and thus, according to the law of action and reaction, causes the missile spin.

Several advantages are obtained by the arrangement described. The possibility of any unbalance due to differences in the above mentioned incline nozzles is thus eliminated.

Further one axially arranged nozzle is probably easier to make than several inclined nozzles.

At subsonic airspeeds the axially arranged nozzle causes less drag than the plane rear end of the missile having several inclined nozzles.

An axially arranged nozzle causes less dispersion of the exhaust gases than a number of inclined nozzles, through which the possibility of pressure damages to objects near the discharge place is reduced.

When the plane canted or cambered vanes are placed in front of the nozzle inlet as shown in the drawing it is possible, owing to the rotation of the exhaust jet, to make the nozzle outlet shorter than had otherwise been the case. Another advantage lies in the fact that a common fin-stabilized rocket by a rather simple modification can be made spin-stabilized. The modification consists of removing the fins and inserting a suitable vane arrangement. Some percentage of the exhaust thrust is made use of for spinning the missile but on the other hand the weight probably will be reduced and the drag of the fins is eliminated, on account of which the airspeed of the missile conceivably may increase.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A rocket missile fitted with a combustion chamber for the propellant contained inside the rocket, an axially arranged de Laval exhaust nozzle extending from said chamber to the rear end of the missile and a number of plane canted or cambered vanes arranged inside the missile in front of the de Laval nozzle exit, said vanes forming an exhaust gas turbine connected to the missile, which turbine causes rotation of the exhaust gases when leaving the missile.

2. A rocket missile as claimed in Claim 1, wherein said vanes are arranged in front of the inlet of the de Laval exhaust nozzle.

3. A rocket missile as claimed in Claim 2, wherein said vanes are arranged around an axially arranged streamlined body.

4. A rocket missile as claimed in any of the preceding Claims, wherein said vanes and said axially arranged body are arranged close to the exit of the de Laval exhaust nozzle.

5. A rocket missile fitted with a combustion chamber substantially as described with reference to the accompanying drawing.

Dated this 16th day of May, 1949.
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1 SHEET

This drawing is a reproduction of the Original on a reduced scale.